Climate Justice and Retrofitting for Energy Efficiency: Examples from the UK and China

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Abstract

Although sharing some common origins with environmental justice, in recent years, climate justice has emerged as a separate domain, one that entails both greater uncertainties and greater temporal and spatial distance between its causes in human activities and climatic shifts or extreme events. This article situates climate justice in relation to environmental justice and wider justice debates. It reflects on the multi-scalarity of climate justice and its bi-dimensional character (the justice of adaptation and mitigation). It then explores three different variants of distributive justice – welfare, equity and equality distribution – through examples from both international climate negotiations and UK and China national energy efficiency retrofit policy. The article aims to illustrate the kinds of differences and problems that originate with three very different ways of interpreting the meaning of a just distribution of the benefits and burdens related to tackling human-origin climate change, and to show how these are in many cases being pitched against considerations of social justice.

1. Introduction

Climate justice is concerned with the duties and rights that arise from the impacts of climate change. In this respect it can be compared with environmental justice, a concept that has developed to draw attention to the extent to which vulnerable communities are affected by human-induced environmental ills. This paper begins by looking at similarities and differences between environmental and climate justice, emphasising what is distinctive in the challenges for justice raised by climate change issues, in particular the long gaps in time and space between causes and effects and the cumulative nature of responsibility. It goes on to highlight the multi-dimensional nature of implementing justice for climate change, which must embrace international, national and local levels and must be differently articulated to address adaptation and mitigation measures. Such measures lead to both distributional costs and benefits for individuals, groups and nations and if unmonitored may lead to further entrenchment of injustices suffered by the already-disadvantaged. The remainder of the paper

is dedicated to bringing out the implications of three different interpretations of distributive justice – welfare, equity and equality distribution – through applying them to climate mitigation efforts, first at the international level of emissions reduction negotiation and then at the national level of domestic retrofit for energy efficiency. It explores the different kinds of distributive justice effected by recent retrofit policies in the UK and China and concludes with a reflection on the trade-offs that seem inevitably to occur between climate change mitigation justice and social justice.

2. What is climate justice?

Climate change is undoubtedly the most visible and dramatic impact of the explosion in human population and activity over the last century, leading it to be described as 'the canary in the coal mine' for our species (Steffen, 2011, p.32).The recognition that the cumulative wastes of human industry can harm not just other species, but other humans, has historically been subject to frequent instances of denial and repression. This is highlighted through the history of the environmental justice movement (EJM), which has tackled the higher-than-expected siting and/or impacts of polluting activities within ethnic minority and socially deprived communities. More recently environmental justice has looked at the siting of environmental benefits as well as hazards and at its co-location with a host of other vulnerabilities besides socio-economic deprivation (Davoudi and Brooks, 2012). The problems encountered by the EJM in establishing responsibility have also sometimes lain in the fact of 'teleconnectivity' or 'flows' − whereby air and water transmit polluting wastes at some distance from their point of origin, in both space and time (Chase, Pielke and Avissar, 2007), making it hard to link a source of contamination with its health impacts.

A further problem with allocating responsibility is that the very industries that contaminated land and water, and destroyed livelihoods, were simultaneously providing jobs and incomes. In other words, an activity that had enhanced social justice by increasing the availability of paid employment in a locality was at the same time inflicting an environmental injustice on the people using the land and/or water there. These problems addressed through the concept of environmental justice seem broadly similar to the problems encountered in climate change justice. The latter shifts the focus from the ground, water and air that people need, to the upper atmosphere, where pollution engenders both gradual climate shifts and more extreme climate events, often at a considerable distance in time and space from the pollution's source.

Comparable with the findings in environmental justice studies, those people worst affected by the changes in the upper atmosphere generally live in the most deprived countries, and are often dependent on agriculture for their livelihood, one of the highly climate-dependent sectors.

While there are further commonalities between the two approaches, such as sharing common origins at grass-roots level (Bond, 2012), there are also several important differences between climate and environmental justice that have implications for the way climate justice is pursued. With environmental injustices, it should be possible to adjudicate on the actions of a corporation or authority in creating a polluting industry in a particular community; for example, through demanding that it mitigate its impacts, or compensate its victims. But with climate injustices, it is harder to say exactly who may be responsible. This is because the latter result from the cumulative actions of many disparate actors, and furthermore, events that are simply the result of climate variation cannot always be clearly distinguished from those that have been caused by human-generated climate change. The victims of both tend to be the same groups of disadvantaged people (Baer, 2011, p331), but while in the first case, the cause is an 'Act of God', in the second case, human agents bear the responsibility.

This raises the question of the level at which human responsibility lies: with individuals, groups, nations, or indeed systems of production and consumption? Some would suggest that climate change is mainly caused by high-emitting individuals or social groups; along these lines one recent study found that reducing the carbon emissions of the richest $1/6^{th}$ of the world's population could, by 2030, bring down global emissions by 50% (Chakravarty *et al.*, 2009). But high-emitters can also be low-income and disadvantaged people (Baer, 2011, p329); for example, those with energy inefficient older homes or for whom high city rents have enforced long work commutes. Can we say that they are more responsible for emissions, just because they cannot afford a more sustainable lifestyle? If, by contrast, we lay the fault with high-emitting industries which operate unnecessarily polluting activities, can we exonerate the state in which their operations are based and which either does not legislate or fails to implement legislation against emissions?

Many would regard the state as the responsible party, both in allowing polluting activity to happen and in drawing benefit from it through various forms of taxation. Yet states do not have a perfectly free choice in setting mitigation policy in a globalised economy:

> {…] global economic interdependence sets limits on the degree to which climate [change mitigation] leaders can continue to ratchet up their carbon constraints and remain competitive, without risking the migration of industry, and hence 'carbon leakage', to jurisdictions with weaker climate policies. (Baer, 2011, p443).

A further point relates to intergenerational climate justice, that is, while these difficulties concern current emitters, much of the global warming we live with today is said to be caused by historic emissions, dating back to the dawn of the industrial revolution in the 1750s (IPCC, 2007). Judged by emissions alone, the early-industrialising nations bear greater responsibility, but it is difficult to stand by this if we take into account that people's awareness of the long-term impacts of industry only came much later, among the distant descendants of the original emitters. As a way forward, it has been suggested that we might with more validity date the beginning of historical responsibility to some point in the 1980s, when states generally began to recognise the impacts of emissions on climate (Bell, 2011, p.35). If this is the case, most of us alive today bear far greater responsibility for future change than did our forebears.

Arising from these kinds of debates, there is growing consensus that climate justice must be viewed as multi-scalar, operating from the international down through the national, community and individual scales, with a corresponding spread of rights and duties at different levels. Another factor which has implications for the kinds of rights and duties extrapolated is that climate change policy is strongly bi-dimensional. This is because it has become increasingly clear that emissions are reaching dangerous levels and a point of no return (IPCC, 2013), and thus rather than solely focusing on mitigating climate change, there is a necessity to adapt to climate change as well. Justice in both mitigation and adaptation policies entails the rights of the victims, and the duties of reducing impacts on them, as well as the duty to ensure that any interventions do not further entrench existing inequalities, and that any benefits that may arise from interventions are fairly distributed (Fussel, 2010; Pavola and Adger, 2006).

Mitigation justice is, however, also focused on the perpetrators who create greenhouse gas emissions in going about their daily business and who must somehow be persuaded to curtail those emissions. Curtailing emissions of course carries with it economic costs as well as risks of free-riding by the non-compliant; individuals and communities may find few incentives to

engage in mitigation beyond the demands of conscience and the behavioural driver of conforming to (what is currently) a relatively weak social norm.

Thus, it is nations rather than individuals and communities who are seen as the most efficacious organisations to bring about climate change mitigation; mitigation justice has therefore tended to be worked out first and foremost between nation-states. In particular, mitigation negotiations have focused on the international scale (Bulkeley *et al.*, 2013), due to the question of the global flows of air and sea, and to corresponding geographical distances between victims and perpetrators of climate harms. Following on international agreements, mitigation must then be rolled out at national and local level. Deciding how to distribute this responsibility fairly between nations, groups and individuals is the purpose of the distributive justice of climate change mitigation, which this paper now explores in more detail. The purpose is not to provide a full account of the justice of climate change mitigation within international politics or national policies, but rather to highlight how at every level, there come into play quite divergent interpretations of what constitutes a just distribution; and to bring out some inherent tensions between climate and social justice. Understanding these factors enables a clearer recognition of the trade-offs, winners and losers, in every climate mitigation initiative, whatever the scale.

3. Distributive justice and climate change mitigation on a global scale

Both debate and policy consideration of climate change justice have tended to focus on distribution, and there is some evidence that although procedural justice has also featured, at least in policy, this is more developed with regard to adaptation than mitigation (Bulkeley *et al.*, 2013). There are several different ways to approach a just distribution. One way of simplifying the issues is to break distributive justice down into three types: welfare distribution, equity distribution and equality distribution (Buttram *et al.*, 1995). Put simply, a welfare distribution, reflecting Rawls' 'difference principle', means more resources are allocated to those in greatest need; equity distribution relies on the idea of 'just deserts', meaning more benefits are received by those making greater contributions (and vice versa); and equality distribution means giving everyone the same thing regardless of either their contribution or need (Davoudi, 2013; Davoudi and Brooks, 2014f).

Welfare distribution is exemplified in Annexe II of the Kyoto Protocol which tasks OECD countries (as at 1992) with giving help to the most vulnerable nations to reduce emissions and adapt to the impacts of a changing climate (UNFCCC, 2013). Welfare justice can be aligned with the mainstream liberal theory of social justice, and in broader terms, implies that the last and most vulnerable should be given the first place to ensure progressive redistribution of benefits (Pavola and Adger, 2006). By contrast, an example of equity distribution is shown by the 'polluter pays' principle, whereby the focus is on making those who cause major emissions liable for the costs of cleaning them up and/or abating them. This includes historical emissions, for which developed countries have far greater responsibility than developing ones (Gardiner, 2011, 315).

On a global scale of climate change policy, a distribution based on equality is manifested in the suggestion that all people, in every nation, should be allowed the same level of per capita emissions (Richardson *et al.*, cited in Steffen, 2011, p24). As a starting point for international negotiations, the equality distribution approach, in terms of proposals for a per capita annual allowance of CO_2 has considerable value in redressing the emissions balance between the richest and poorest nations, as well allowing consideration of population size in setting the level at which each nation's emissions should be capped. However, setting the same cap for each country might seem to ignore the fact that, while a developing country (China) is the biggest-emitting nation in the world today (Schreurs, 2011), it is the developed countries that have contributed the most emissions historically – an estimated 29% from the USA, 26% from the nations of the EU, and just 8% from China. Equally, while the average income in the US and UK in 2007 was $45,000 per annum, in China, it was just $2,604 per annum (Gardiner, 2011, p315). Thus, for a citizen of the UK and of China to be set the same emissions cap both ignores the greater relative historical contribution of the UK citizen and their current greater personal resources. Furthermore the emissions rates of the US, UK and the rest of the developed world are already considerably lower than they might have been, due to the outsourcing of their energy-intensive manufacturing to the developing world 'while their affluent consumer lifestyles have been sustained or enhanced' (Christoff and Eckersley, 2011). This would be an argument for setting per capita allowances higher in China than in the US. However, it is worth noting that that such off-shoring is not without its benefits to the developing world, where it creates jobs and contributes to economic growth.
Equally, a per capita emissions target takes population numbers at face value and thus fails to give proper recognition to the contribution to mitigation made by China's 'one child' policy,

which has been in operation for over three decades, and clearly contributed to arresting population growth and its attendant emissions increases over that period[1] (PRC National Climate Change Program, cited in Schreurs, 2011, p453; Symons, 2011, p.87).

In practice, since China's per capita emissions were recently only a quarter of US levels, a per capita emissions allowance would be likely to work in China's favour, by raising what is allowed for each citizen (Baer, 2011). In its international dealings, however, China has not pursued this approach to the distributive justice of mitigation. Instead it has subscribed to a combination of 'welfare' (need-based) distribution and 'equity' (desert-based) distribution of emissions. In line with the welfare approach, China is treated in the Kyoto protocol as a developing country and thus, based on its need to pursue high levels of growth to raise its population out of poverty, it sets its targets in terms of reducing energy consumption per unit of GDP, a measure known as 'energy intensity' (Harris, 2011). This means in effect that it may continue to increase emissions as long as these are decreasing in relation to its GDP.

The 'equity distribution' element arises because through its efforts to reduce its energy intensity, China has been extremely active in developing a green economy and rolling out emissions reduction policies at all levels of government (ibid.; Schreurs, 2011). While China's energy consumption has been increasing with its growth rate, the fact that the former is considerably lower than the latter is attributed to the success of energy strategies from the rolling series of five year energy efficiency plans (Price *et al.*, 2012). China's historic and actual commitment to a large state apparatus (Jacques, 2009) may mean such planning is more achievable than in a context such as the UK or US, where there are both political and austerity-induced pressures to keep the role of the state to a minimum. Although, in this context, it is interesting to note that Australia and Canada are among the weakest of the developed countries in terms of their energy intensity, besides having the poorest performance against Kyoto targets and the strongest increase in per capita and aggregate emissions of both developed and developing countries (Christoff and Eckersley, 2011).

China has adopted a 'polluter pays' position, investing in a wide range of programmes to mitigate its own emissions with far more commitment and efficacy than has been shown by many comparable developing and developed countries; it is probably due to the sheer scale of

[1]Although the 'one child' policy was recently rescinded in response to China's ageing demographic.

the country and its emissions that this proactive commitment to 'equity' climate justice generally fails to get the recognition it deserves.

In the next section we will turn to domestic energy efficiency retrofit and examine how these different kinds of distribution are combined to further or hinder climate and social justice at a national level.

4. Different types of distributive justice and energy efficiency retrofit at national scale

Welfare

Welfare distribution in climate change mitigation at the domestic level would imply that it is those who are in the greatest need who should receive the most support. However, the concept of 'need' is not self-evident with regard to energy efficiency retrofit – does it imply financial need or heating need – or a combination of both? The Warm Front policy (as it was called in England – similar policies with different names were rolled out in Scotland, Wales and Northern Ireland), ran from 2004-2012, and gave government grants to low-income and vulnerable private tenants and home owners to improve the energy efficiency of their homes. In the case of social housing tenants, grants were given to the social housing associations under the parallel Decent Homes initiative, one of whose objectives was to raise all social housing to minimum standards of thermal comfort.

To be eligible for Warm Front grants, people were judged against various criteria used as a proxy for need, including being in receipt of specified benefits and credits, being disabled, aged over 60, or with a young family. These groups were given grants, subsidies and practical support to arrange for the retrofit of their homes up to a value of £3,500. The main purpose of the grants was to raise households out of fuel poverty (defined as spending more than 10% of income on heating), rather than to lower their emissions, although the latter might be supposed a side-effect of improving domestic energy efficiency. Unfortunately, because people's income and the existing thermal requirements of their homes were not taken into account, this policy was unsuccessful in reaching those most in need (NAO, 2009; Hills, 2012). Nevertheless, it did manage to significantly increase the thermal efficiency of millions of homes through, for example, cavity wall insulation (DECC, 2011).

A thermal, rather than financial interpretation of greatest 'need' might, however, be equally appropriate to large countries with significant discrepancies in climate between different geographical regions. This would suggest a welfare distribution of support for energy efficiency retrofit based on location, rather than, or in conjunction with, income. Such a distribution would be relevant to China: while there is an approximately 5 degree difference in yearly average temperature between the UK's coldest and hottest places (Shetland Islands compared with St Helier, Jersey); in China, the difference can be as much as 25 degrees (Hailar in Inner Mongolia compared with Haikou on Hainan Island). This can explain why an aspect of China's mitigation retrofit policy seems to conform to this second interpretation of what mitigation 'need' entails in welfare distribution. The 11th five-year plan (2006-10) for energy savings and emissions reduction sought to reduce 'heat intensity' – heating used per metre square – by 50% by 2010. It had three policy tools to effect this change: energy price control, heat meter installation, and financial incentives to retrofit for energy efficiency in the country's cold and severe cold zones (two of the country's five defined thermal zones). The rate set for the severe cold zone was 5 RMB (or Yuan) per m^2 higher than that for the cold zone; both rates were set low, coming to around 15% the cost of the retrofit per square metre (Price *et al.*, 2012).

Unlike in the UK, the goal was set in terms of reducing 'heat intensity' (defined as heating used per metre square) rather than in terms of creating an overall financial saving for the consumer. According to Price *et al.* (2012), the early indications were that the scheme has low uptake because the subsidy for retrofitting per metre square was set too low, so residents would have to find a large proportion of the costs of retrofit themselves. In practice they were keener to adopt another option offered by the government, in terms of installing heat metering (Price *et al.*, 2012, p.2170). A particular problem with the welfare approach to mitigation distribution, targeting those in greatest need, is that, by definition of being in need − either because they cannot afford enough energy or because cold conditions mean they need a great deal of it − they will seek to improve their conditions when the opportunity arises. So a welfare policy that helps those most in need with energy efficiency retrofit may allow them to increase their energy consumption to attain thermal comfort. This is an example of the so-called the 'take back' or 'rebound' effect, first identified by Jevons in the 19th century. It means that improved energy efficiency can actually result in increased energy use, as energy costs come down and people spend more on energy and/or other goods (see Davoudi, Dilley and Crawford, this issue).

'Rebound' may be seen to represent a gain for social justice when it applies to low-income beneficiaries, who have been unable to afford thermal comfort in their homes prior to retrofit, but it can also be a loss for climate change mitigation. Furthermore, any consumer, not just the most needy, may be susceptible to 'rebound' subsequent to the efficiencies of retrofit, in terms of more electricity hungry gadgets, and/or more frequent use of energy-consuming services, such as clothes and dishwashing machines. This suggests that, as in the Chinese government's recent retrofit policy explained earlier, it is appropriate to supplement financial incentives to retrofit with interventions to modify consumer behaviour, such as metering and energy pricing control, if more energy-efficient homes are not to result in greater overall domestic energy use (Lin *et al.*, 2013).

However, in the current UK context, rebound is unlikely to present a major problem, such is the regularity of major rises in energy costs, due at least in part to deregulation of the industry and the lack of transparency in its pricing policies (Which, 2013), as discussed in more detail below.

Equity

The 'equity' form of distributive justice might operate in two, related, ways in climate change mitigation at the domestic level. In its positive form, it would imply greater rewards to the 'deserving' individuals who make the greatest contributions to society, in terms of reducing their emissions. In its negative version, it would imply, as we have seen earlier, that the 'polluter pays' – the person with bigger emissions must accept the financial costs of reducing them. Both are potential consequences of a current UK domestic emissions mitigation policy called 'Green Deal'. This is the successor policy to 'Warm Front', described in the previous subsection, and is the flagship policy for retrofitting. Both Warm Front and Green Deal are in fact complex and multi-faceted *groups* of policies, providing support for a wide range of domestic retrofit interventions in forms that include grants, vouchers, loans and Feed in Tariffs to those fitting their homes with energy efficiency measures of various kinds (Dilley, 2012: 71-4).

The central component of Green Deal is a government loan for retrofit interventions, which seems more likely to be taken up among owner occupiers than private tenants (other provisions exist for social housing), as retrofitting loans would be taken out by landlords but

energy savings made by tenants.[2] The fact that those on higher incomes generally consume more energy (Summerfield *et al.*, 2010; Druckman *et al.*, 2008), and so pay more in terms of higher fuel bills, provides a face-value incentive for them to explore the potential for reducing their domestic energy consumption through a Green Deal assessment (for which they must, at the time of writing, pay around £120). If they are satisfied from the assessment that the savings will be worth more to them than the cost of the retrofit, they can secure a government loan for the work, which is then directly deducted from their energy bill in small instalments. This seems to fit an equity perspective, whereby the greater people's contributions to domestic emissions mitigation, the greater should be their financial reward.

However, although a condition of Green Deal funding is that the intervention should cost less than the anticipated savings, importantly, this is not guaranteed. In the context of rapidly rising costs of energy in the UK, those who take up Green Deal may continue to see their bills rise; it is just that this will be to a lesser extent than would have been the case had they not invested in the energy efficiency retrofit. Thus, they will not always recoup the costs of the retrofit intervention – a case where the polluter pays principle comes into effect, and they have been obliged to pay more to emit less, with no net benefit. It appears that there is little financial incentive for individual householders to subscribe to this kind of distributive justice, particularly when it is safe to assume that for each one who chooses to 'do the right thing', many others will act purely on the basis of economic self-interest – the problem of free-riding.

Pre-existing the Green Deal but now eligible to be funded by it is the installation of domestic renewable energy generation, which is rewarded through the payment to the householder of a Feed-In-Tariff (FIT). The FIT is set by energy companies at an advantageous rate (fixed over long time period) for each unit of electricity households generate from domestic renewables, such as photovoltaic panels. Here the rewards are significant and their benefits self-evident. These kinds of Green Deal loans favour the owners of larger properties, because eligibility

[2] This is because, in the UK, apart from some student lets, most private tenants pay their own energy costs separate from the rent. So, while tenants benefit from more energy efficient buildings, it is the landlords who decide whether to pay to make the changes. The Green Deal aims to tackle this split incentive. According to the Government Carbon Plan (DECC, 2011:37), "from 2016, domestic private landlords will not be able unreasonably to refuse their tenants' requests for consent to energy efficiency improvements". However, enforecement will be conditional on "there being no net or upfront costs to landlords".

for such technologies demands a larger space, for example, solar panels, which need a large roof-space to generate sufficient energy, and geothermal systems, which require an adequate-sized outdoor area for installation.

This is a case where, in line with equity principles, investment in emissions mitigation receives a quite substantial reward, particularly for those early-subscribers to the scheme, able to continue to benefit from the original high-set rates. However, somewhat countering the equity distribution of FIT, costs for this reward are then passed back by the energy companies to the consumer in the form of a surcharge raised on the energy generated from this source that has led to higher energy bills for all (Dilley, 2012). By contrast with Warm Front, Green Deal is not directed at low income and vulnerable households (this is the province of the accompanying policy, Energy Companies Obligation; see next section). While lacking in social justice aims compared with Warm Front, it has a potentially stronger climate justice impact, due to the fact that it is more likely to appeal to those on the higher emissions end of the scale. But in practice, the combination of continued strong rises in the consumer costs of energy, and historically low interest rates on loans means that mitigation gains are unlikely because there simply is not a strong enough incentive to encourage uptake.

Thus, although more than 70,000 have used a government-backed Green Deal assessment of how much energy they could save through retrofit, actual uptake of the government loan scheme since it began in January 2013 has been extremely low – 12 households as of end August 2013 (Meyer 2013).The explanation seems to lie in the discrepancy between the interest rate offered by the government and rates homeowners can leverage from their own mortgages. The Green Deal loan interest rate is at around 7%, the market rate for an unsecured loan, but because retrofit can be financed in most cases by extending a mortgage, at the time of writing, considerably lower than this rate, there is ultimately little incentive for the kinds of people who will benefit from Green Deal to actually use the government scheme.

Overall, it can be concluded that, on the domestic scale, an equity version of distributive justice underlies the current UK domestic retrofit policy, as, at least in theory, those who make greater contributions to mitigating emissions are also those who can make greater financial savings from domestic retrofit. However, as the popular rejection of the Green Deal loans scheme has shown, the reality is more complex, including the context of energy prices, loan prices, personal ethics and social norms. Unfortunately, as the vast majority of those

paying for a Green Deal assessment did not take up the government Green Deal loans, no further information is available on their actions, so the ultimate mitigations impact of Green Deal is unknowable. Furthermore, the fact that the cost of at least some of the rewards provided for Green Deal retrofit interventions is levied from all energy users alike suggests that, whatever its superior potential benefits for climate justice, implementing equity distributions in this way may have regressive implications for social justice.

Equality

An equality distribution with regard to the costs of energy efficiency retrofit is the largely unacknowledged side-effect of a pendant policy to Green Deal, which shifts focus from individual householder initiatives to greening the energy industry in line with emissions reductions targets. This is the Energy Companies Obligation (ECO) scheme, a separate initiative running alongside Green Deal, which places legal obligations on the larger energy suppliers to deliver energy efficiency measures to domestic users. This includes the Carbon Emissions Reduction Obligation, the Community Obligation and the Home Heating Cost Reduction ('Affordable Warmth') Obligation (Ofgem, 2014). In continuation with earlier schemes EEC and CERT, these schemes oblige energy companies to help their customers achieve energy efficiency, in particular those customers who meet qualifying criteria for being in a vulnerable or low income category. The costs for all these schemes are passed back to customers through general price rises in the cost of energy (DECC, 2011:37).

Among this raft of ECO policies, the 'Affordable Warmth' Obligation, stands out in that it is not even targeted at the low income and vulnerable, but yet the costs are spread equally among all energy users (as for all ECO initiatives, as explained above). Affordable Warmth covers those homes that do not meet the Green Deal rule; that is, the project will cost less than the financial savings that can be estimated to accrue from it. This is expected to support, for example, owners of houses with stone walls which are common in the UK's rural areas and notoriously costly to insulate. This obligation alone is expected to cost £1.3 billion to the energy companies, which will be recouped through price rises for all energy consumers equally. Low income households use less energy for heating, but spend proportionately more of their income on it, so in effect, they are bearing a disproportionate amount of these costs (Dilley, 2012) and in the case of Affordable Warmth, not subsidising only other low income households to make energy efficiency improvements, but owners of what are often attractive and high-value period properties, that happen to be built from stone.

This takes place in a context where privatised and deregulated energy companies are able to continually raise prices at levels high above the rate of inflation, with a lack of transparency about how this might relate to actual increases in supply costs (Which 2013). Outcries over the ever-rising expense of domestic energy have prompted the Coalition government to take steps in 2014 to move the costs of the ECO from the energy companies back to general taxation, although at the time of writing it is unclear precisely when and how this will be brought into effect. Broadly speaking, this could be seen as retrenching from an equality to an equity distribution of the costs of mitigation, given that higher energy use is associated with higher earnings and thus greater taxation, so "the polluter pays". It may represent a better trade-off between social and climate justice than the original ECO policy, but of course this is in turn dependent on the generally progressive nature of UK taxation.

5. Conclusion

This paper has reviewed the idea of climate change justice, and whether it should be viewed as an extension of environmental justice. We have argued that while there are some overlaps, climate change presents a distinct set of challenges to justice due to the following factors: a) difficulties in distinguishing whether an event results from climate change or normal climate variation b) difficulties in tracing back climate shift or events to a source, and questions over where responsibility lies – at the level of the individual, groups, state or the international community c) the difference between the mitigation and adaptation aspects of climate change, which imply different sets of right and duty holders (who may also, due to teleconnectivity, be located in disparate parts of the globe).

Focusing on the justice of climate change mitigation, we discussed that, due to teleconnectivity, climate change mitigation policy is first and foremost worked out at an international scale, between nation states. Agreements and positions developed at the international scale are then rolled out at lower national and local levels, often informed by the form of justice that concerns the distribution of burdens and benefits. We also illustrated how the three main subtypes of distributional justice ─ equality, equity and welfare distributions ─ may play out in the context of climate change mitigation by drawing on different examples from the various scales of mitigation initiative. This shows that, in practice, more than one

type of distributional justice may inform a country's position and that trade-offs are made between social and climate justice.

While in the short term, high and increasing energy price rises in the UK may act as a greater stay on national emissions than might result from the effective implementation of energy efficiency retrofit, in the longer term the cost of energy combined with a failure to step up retrofit efforts is likely to aggravate the existing social injustices of fuel poverty and excess winter deaths (Hills 2012). This suggests the need for a balance between climate justice and social justice that in current circumstances can only be achieved through the state resuming its greater role in supporting low income and vulnerable people to achieve energy efficiency retrofit, drawing on the revenues from the current progressive system of taxation (one that takes proportionately more from those who earn more).

In this regard, China, with its historical and actual commitment to a large state sector, seems to offer more promise in delivering climate change mitigation justice by being able to incrementally fine-tune its five-year plans for energy efficiency to create effective policies through a mixture of behaviour change, retrofit and price control. Nevertheless, it should be borne in mind that, as noted elsewhere in this issue, whatever China's success in reducing its energy intensity through domestic retrofit, the embodied energy lost in its vast reconstruction programme which is largely needed to accommodate rapid urbanisation (Chen, 2011), is likely to outweigh all gains. Thus on the domestic as well as the international scale, considerations of social justice – providing more of the population with the opportunity of urban dwelling with attendant higher incomes – continue to outweigh those of climate justice. Furthermore, the extent to which social justice is the main motivation for economic growth remains an open question.

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